
Uninterruptible Power System (UPS)

G8000 Series Installation Manual

REQUIREMENT

- Read this operation manual carefully before installing the UPS.
- Retain this manual with the UPS for easy reference when required.
- This manual was written for the consulting engineer, architect, and electrical contractor.

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TOSHIBA CORPORATION

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Notice

Please inform Toshiba Corporation or authorized representatives in case of inconsistencies, omissions, or questions.

The instructions contained in this manual are not intended to cover all of the details or variations in equipment, or to provide for every possible contingency concerning installation, operation, or maintenance. Should further information be required or if problems arise which are not covered sufficiently contact your Toshiba sales office.

The contents of this instruction manual shall not become a part of or modify any prior or existing agreement, commitment, or relationship. The sales contract contains the entire obligation of Toshiba International Corporation's UPS Division. The warranty contained in the contract between the parties is the sole warranty of Toshiba International Corporation's UPS Division and any statements contained herein do not create new warranties or modify the existing warranty.

Any electrical or mechanical modifications to this equipment without prior written consent of Toshiba International Corporation will void all warranties and may void the UL/CUL listing. Unauthorized modifications can also result in personal injury, death, or destruction of the equipment.

1. Introduction

This manual is intended to help implement safe and correct transportation, installation and wiring of the G8000 Series Uninterruptible Power System (hereafter referred to "UPS").

Before transportation, installation and wiring of the UPS, please read through all of the chapters. Above all, read the "General Safety Instructions," "Important Safety Instructions," "Safety Precautions" and "Installation Precautions" chapters, as these must be carefully read. Please make sure that you have a thorough understanding of the information in these 4 chapters.

Personnel that will install the UPS should carefully read this manual before installation.

Keep this manual close to the UPS so you can refer whenever necessary.

Also, please read through the "Operation Manual." The Operation Manual describes the important instructions to be used during UPS operation. The manuals should remain together.

UNINTERRUPTIBLE POWER SUPPLY

Complete the information below for the UPS system received.

Unless otherwise specified, the warranty period for the UPS or UPS part is 36 months from the shipment date (see TIC bill of lading).

Unless otherwise specified, the warranty period for a UPS battery is 24 months from the shipment date (see TIC bill of lading).

Please complete the following information and retain for your records.

Job Number: _____

Model Number: _____

Serial Number: _____

Application: _____

Shipment Date: _____

Installation Date: _____

Inspected By: _____

Manual's Purpose and Scope

This manual provides information on how to safely install, operate, and maintain your TIC power electronics product. This manual includes a section of general safety instructions that describes the warning labels and symbols that are used throughout the manual. Read the manual completely before installing, operating, or performing maintenance on this equipment.

This manual and the accompanying drawings should be considered a permanent part of the equipment and should be readily available for reference and review. Dimensions shown in the manual are in metric and/or the English equivalent.

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Contacting Toshiba's Customer Support Center

Toshiba's Customer Support Center can be contacted to obtain help in resolving any **Uninterruptible Power Supply** system problems that you may experience or to provide application information.

The center is open from 8 a.m. to 5 p.m. (CST), Monday through Friday. The Support Center's toll free number is US (800) 231-1412/Fax (713) 466-8773.

You may also contact Toshiba by writing to:

Toshiba International Corporation
13131 West Little York Road
Houston, Texas 77041-9990
Attn: UPS Product Manager.

For further information on Toshiba's products and services, please visit our website at www.tic.toshiba.com.

2. General Safety Instructions

DO NOT attempt to install, operate, maintain or dispose of this equipment until you have read and understood all of the product safety information and directions that are contained in this manual.

Safety Alert Symbol

The **Safety Alert Symbol** indicates that a potential personal injury hazard exists. The symbol is comprised of an equilateral triangle enclosing an exclamation mark.



Signal Words

Listed below are the signal words that are used throughout this manual followed by their descriptions and associated symbols. When the words **DANGER**, **WARNING** and **CAUTION** are used in this manual they will be followed by important safety information that must be carefully adhered to.

The word **DANGER** preceded by the safety alert symbol indicates that an imminently hazardous situation exists that, if not avoided, will result in death or serious injury to personnel.



DANGER

The word **WARNING** in capital letters preceded by the safety alert symbol indicates that a potentially hazardous situation exists that, if not avoided, could result in death or serious injury to personnel.



WARNING

The word **CAUTION** in capital letters preceded by the safety alert symbol indicates that a potentially hazardous situation exists which, if not avoided, may result in minor or moderate injury.



CAUTION/ATTENTION

The word **CAUTION** or **ATTENTION** in capital letters without the safety alert symbol indicates a potentially hazardous situation exists which, if not avoided, may result in equipment and property damage.

CAUTION

3. IMPORTANT SAFETY INSTRUCTIONS

SAVE THESE INSTRUCTIONS

This instruction contains important instructions for the G8000 Series that should be followed during the installation, operation, and maintenance of the UPS systems. Please refer to the battery manufacturer's instructions for details on operating and maintaining the batteries for each system.

The input and output of the UPS System are NOT equipped with an over-current protection device, or an output disconnection at the AC output. Therefore, a circuit breaker should be provided by the user between the UPS output and the critical load input. The minimum device ratings should be as follows:

<u>Capacity</u>	<u>Rated Output</u>	<u>Breaker Rating</u>	<u>Capacity</u>	<u>Rated Output</u>	<u>Breaker Rating</u>
125kVA	380V/220Vac	380V-250A	100kVA	480V/277Vac	480V-150A
180kVA	380V/220Vac	380V-350A	150kVA	480V/277Vac	480V-225A
250kVA	380V/220Vac	380V-500A	225kVA	480V/277Vac	480V-350A
			300kVA	480V/277Vac	480V-450A

Circuit breakers should be provided by the user between AC input (or Bypass input) and power sources. The minimum device ratings should be as follows:

<u>Capacity</u>	<u>Rated Input</u>	<u>Breaker Rating</u>	<u>Capacity</u>	<u>Rated Input</u>	<u>Breaker Rating</u>
125kVA	380V/220Vac	380V-250A	100kVA	480V/277Vac	480V-150A
180kVA	380V/220Vac	380V-350A	150kVA	480V/277Vac	480V-225A
250kVA	380V/220Vac	380V-500A	225kVA	480V/277Vac	480V-350A
			300kVA	480V/277Vac	480V-450A

The maximum ambient temperatures in which the UPS should be operated is 40°C (104°F) or 32°C (90°F) maximum if the battery system is to be subjected to the same temperature.

The nominal battery voltage for these models is 336Vdc for 125, 180 & 250kVA, and is 360Vdc for 100, 150, 225 & 300kVA. The nominal battery float voltage is 375Vdc for 125, 180 & 250kVA, and is 405Vdc for 100, 150, 225 & 300kVA.

Only a certified service representative with battery experience should perform service on batteries. Keep unauthorized people away from batteries.

Please refer to the battery manufacturer's instruction when battery maintenance and/or replacement are scheduled.

CAUTION



Misuse of this equipment could result in personal injury and/or equipment damage.

In no event will Toshiba Corporation be responsible or liable for either indirect or consequential damage or injury that may come from the use of this equipment.

4. Safety Precautions

Application

The UPS shall NOT be applied to support equipment (*) that could affect the human lives.

Special considerations are required when applying this UPS to the equipment () that affect human safety and/or maintain public services.**

Be sure to contact/inform Toshiba if it is such a case. The application without special consideration may cause serious accidents.

- *
 - Medical operation room equipment
 - Life support equipment (artificial dialysis, incubators, etc.)
 - Toxic gas or smoke eliminators
 - Equipment that must be provided under fire laws, construction standards or other ordinances
 - Equipment equivalent to the above
- **
 - Equipment to supervise or control airways, railways, roads, sea-lanes or other transportation.
 - Equipment in nuclear power plants.
 - Equipment to control communications.
 - Equipment equivalent/similar to the above mentioned.

Disclaimer

In no event will Toshiba Corporation be responsible or liable for either indirect or consequential damage or injury that may come from the use of this equipment.

Any modifications without authorization by Toshiba could result in personal injuries, death or destruction of the UPS.

Warning Labels Check

Make sure all the warning labels are accordingly placed in the appropriate locations (see page 10~13).

If a label is missing or illegible, contact Toshiba or authorized representatives.

General Terms



WARNING

Do NOT remove the rear/side panels.

The parts inside carry energy-high current. That may result in electric shock, burns, personal injuries or UPS faults by removing these panels.



PROHIBITED

Do NOT modify the UPS, relocate after initial installation or replace parts by untrained personnel.

Electrical shock, injury or UPS faults may result if non-certified technicians attempt to modify or relocate the UPS.

Please contact Toshiba if you need UPS modifications or plan to move the UPS.



PROHIBITED

Transportation



WARNING

When moving the UPS using a crane, follow the specified work procedure (*) and keep the suspension wire angle within 60°.

Moving the UPS by any method other than that specified may cause personal injury by being crushed or trapped by the UPS when it falls or overturns.

* As per specification in chapter 8.



MANDATORY

When moving the UPS, do NOT tilt the UPS more than 10° from upright.



Titling the UPS more than 10° may cause personal injury by being crushed or trapped by the UPS when it falls or overturns.







MANDATORY

5. Installation Precautions

Personnel

 WARNING	
Please have a certified/qualified electrician install the UPS per local and/or national electric codes.	
UPS faults or improper operation may occur if not installed properly per codes and the installation manual.	 MANDATORY

Transportation/Unpacking

 CAUTION	
Do not transport, move, store, or place the UPS on its side.	
Excessive force applied from heavy objects inside may damage the UPS.	 PROHIBITED
Avoid vibration or shock exceeding 0.5G to the UPS.	
Failing to observe this precaution may cause damage to the UPS.	 PROHIBITED
When unpacking the unit, do not give a direct shock or impact to the UPS with a hammer or disassembling tool.	
It may cause damage to the UPS.	 PROHIBITED

Installation Environment



 CAUTION
<p>The UPS is to be installed in a controlled environment.</p> <p>Improper storage and installation environment may deteriorate insulation, shorten component life and cause malfunctions.</p> <p>Keep the installation environment per standard described in Table 5.1.</p> <div style="text-align: right; padding-right: 20px;">  MANDATORY </div>

Table 5.1 - UPS Installation Environment Standard

No.	Item	Environment standard	
1	Installation location	Indoors	
2	Ambient temperature	Minimum temperature: 0°C, Maximum temperature: 40°C The average temperature over any 24-hour period must be in the range 5 to 35°C.	
3	Relative humidity	The relative humidity must be held between 30 and 90%. There must be no condensation due to temperature changes.	
4	Altitude	This equipment must not be applied at altitudes that exceed 1000m (3240 ft) above seal level.	
5	Vibration and mechanical shock	<p>Vibrations in the installation environment must have frequencies either lower than 10 Hz, or higher than 20 Hz.</p> <p>For vibrations under 10 Hz, the acceleration due to those vibrations must not exceed 0.5 G.</p> <p>For vibrations over 20 Hz and under 50 Hz, the acceleration due to those vibrations must not exceed 0.5 G.</p> <p>For vibrations over 50 Hz and under 100 Hz, the total amplitude must not exceed 0.1 mm.</p>	
6	Dust	Dust in the room where the UPS is installed must not exceed normal atmospheric dust levels. In particular, that dust must not include iron particles, oils or fats, or organic materials such as silicone.	
7	Flammable gas	There should be no flammable/explosive gas.	
		Hydrogen sulfide (H ₂ S)	No more than 0.0001 PPM
		Sulfurous acid gas (SO ₂)	No more than 0.05 PPM
		Chlorine gas (Cl ₂)	No more than 0.002 PPM
		Ammonia gas (NH ₃)	No more than 0.1 PPM
		Nitrous acid gas (NO ₂)	No more than 0.02 PPM
		Nitrous oxides (NO _x)	No more than 0.02 PPM
		Ozone (O ₃)	No more than 0.002 PPM
		Hydrochloric acid mist (HCl)	No more than 0.1 mg/m ³

WARNING

Keep the specified clearance around the UPS.

Leaving no space makes it difficult to carry out maintenance, inspections, causes insufficient ventilation, and cooling leading to malfunctions.



MANDATORY

Keep the UPS room clean.

Use a vacuum cleaner to clean the UPS.
Also, Do NOT use silicon-contained waxes on the floor in the UPS room and in the related room as this may cause static electricity.



MANDATORY

Make sure the air vents on the front and top of the UPS are NOT blocked

Blocking the vents will cause the temperature inside the UPS to rise and may result in fire or UPS faults.



PROHIBITED

Do NOT install the UPS close to a water source.

It may cause electrical shock, UPS fault, or other accidents.



PROHIBITED

Please ask Toshiba or authorized representatives where the UPS and/or components are to be disposed.

It is illegal to dispose of certain components without conforming to environmental regulation for industrial/commercial waste.



MANDATORY

Wiring/Connection



WARNING

Be careful when connecting the UPS to the battery panel.

A wrong connection may cause damage to the UPS, battery, or charger.

Perform wiring and connections with correct polarity.



PROHIBITED

The tightening torque of screws must conform to the tightening criteria.

Loose connections may cause fire due to heating.



MANDATORY

When making wire connections or handling the wires, observe the following precautions.

- Do not forcibly bend or pull the wires or damage the insulation.
- Do not place heavy objects on top of the UPS.

Failing to observe this precaution may damage the insulation of the wires or may cause a fire or an electric shock hazard.



MANDATORY

Connect ground wire to the earth ground terminal only.

A missing ground wire may cause an electrical shock hazard.
Connecting to more than one ground may cause ground loop.
See the chapter titled "Wiring" for wiring details.



MANDATORY

Warning label check

- (1) Warning label locations on the UPS are shown in the Figures below.
Please make sure these warning labels are placed in specified spots.
- (2) Please read all warning labels and understand what they mean.
- (3) Make sure warning labels are always legible. Do NOT allow the labels to be removed or covered.

Locations of the Warning Labels (100/125 kVA).

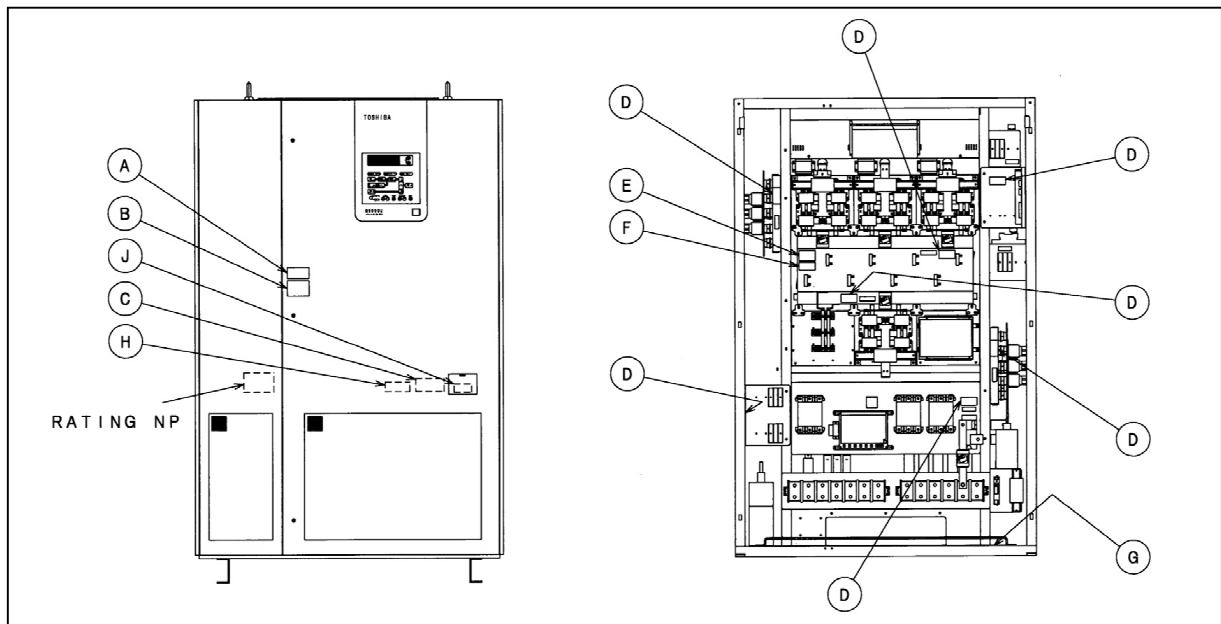


Figure 5.1 - 100/125kVA UPS exterior/interior showing warning labels.

Locations of the Warning Labels (150/180/225 kVA).

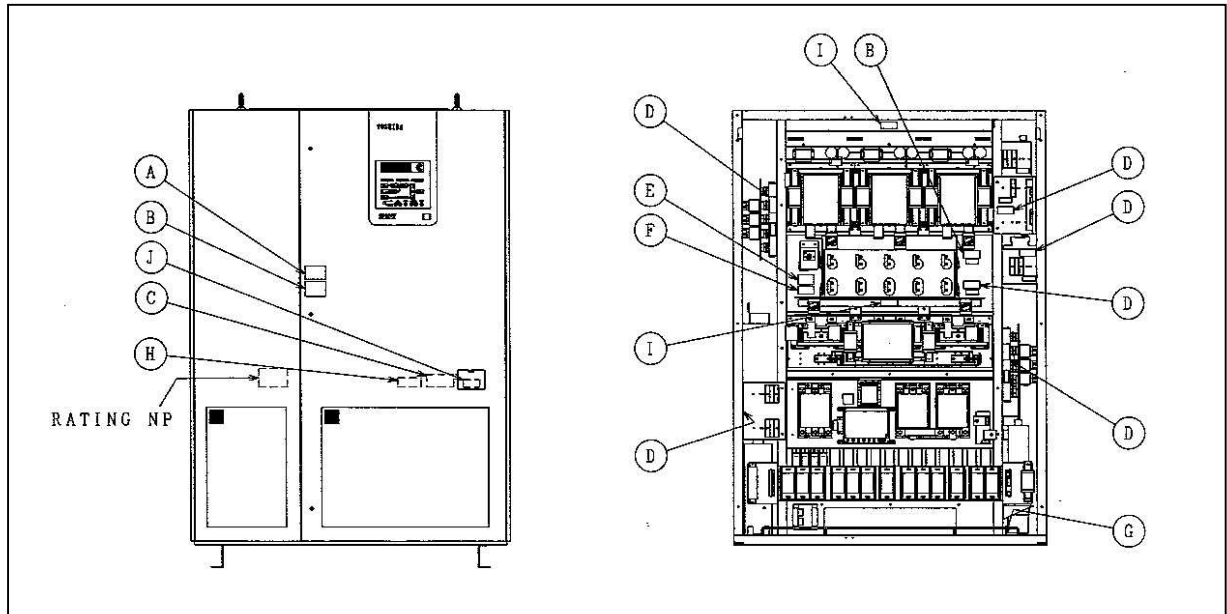


Figure 5.2 - 150/180/225kVA UPS exterior/interior showing warning labels.

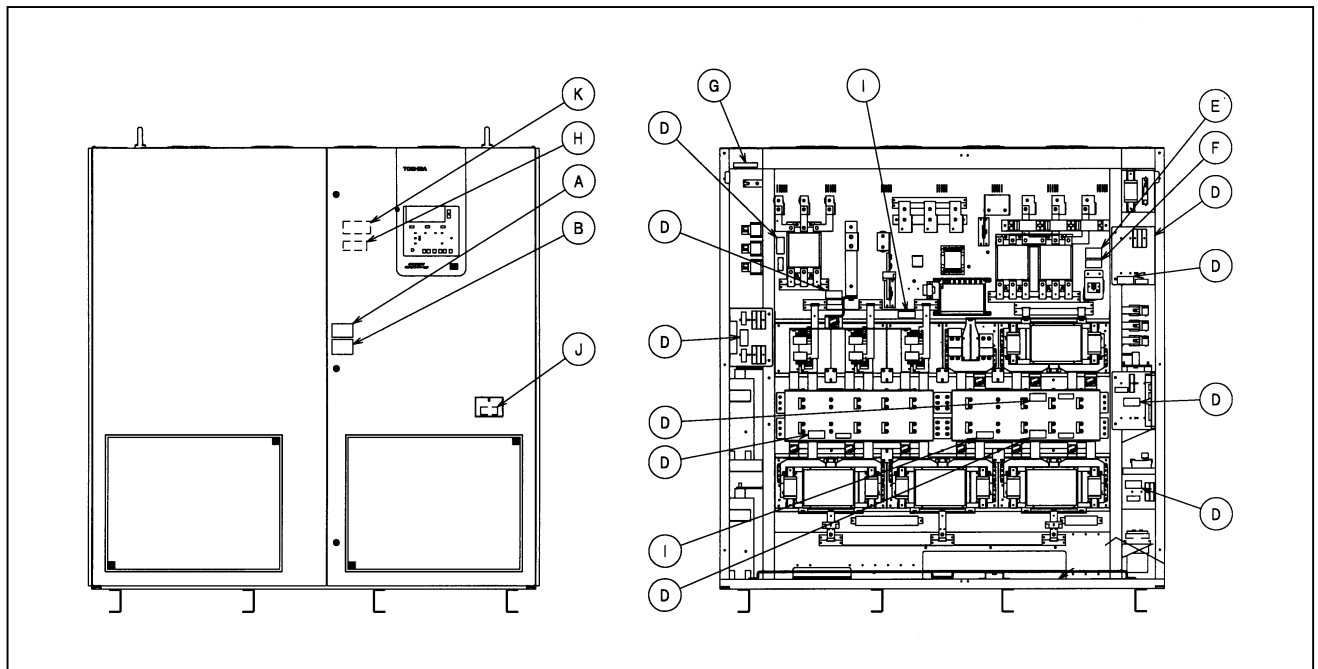


Figure 5.3 - 250/300kVA UPS exterior/interior showing warning labels.

The meanings of the following label symbols are as follows:

1)



The lightning flash with arrowhead within a triangle is intended to tell the user or the service personnel that parts inside the product are a risk of electric shock to personnel.

2)



The ground symbol in a blue circle is intended to tell the user or the service personnel the location of the equipment-grounding conductor.

(A)

DANGER

CONTAINS PARTS NOT SERVICEABLE BY THE USER

Do not remove cover

No user serviceable parts inside.

Refer servicing to qualified service personnel.

Intended for installation in a controlled environment.

(B)

RISK OF ELECTRIC SHOCK

This UPS receive power from more than one source-disconnection of all sources is required to de-energize this unit before servicing.

Dangerous electric charge may be stored in capacitors and associated circuitry.

Wait at least five (5) minutes for power to dissipate then check voltage before servicing.

(C) for 125/180kVA

USE COPPER CONDUCTORS ONLY
REFER TO INSTRUCTION MANUAL REGARDING
TIGHTENING TORQUE OF TERMINAL BLOCKS.

1	2	3	4	5	6	7	8	9	10	11	12	13
U	V	W	U	V	W	N	U	V	W	N	-	+

380V
AC INPUT

380V
BYPASS INPUT

380V
AC OUTPUT

375V
BATTERY

(C) for 100/150/225kVA

USE COPPER CONDUCTORS ONLY
REFER TO INSTRUCTION MANUAL REGARDING
TIGHTENING TORQUE OF TERMINAL BLOCKS.

1	2	3	4	5	6	7	8	9	10	11	12	13
U	V	W	U	V	W	N	U	V	W	N	-	+

480V
AC INPUT

480V
BYPASS INPUT

480V
AC OUTPUT

400V
BATTERY

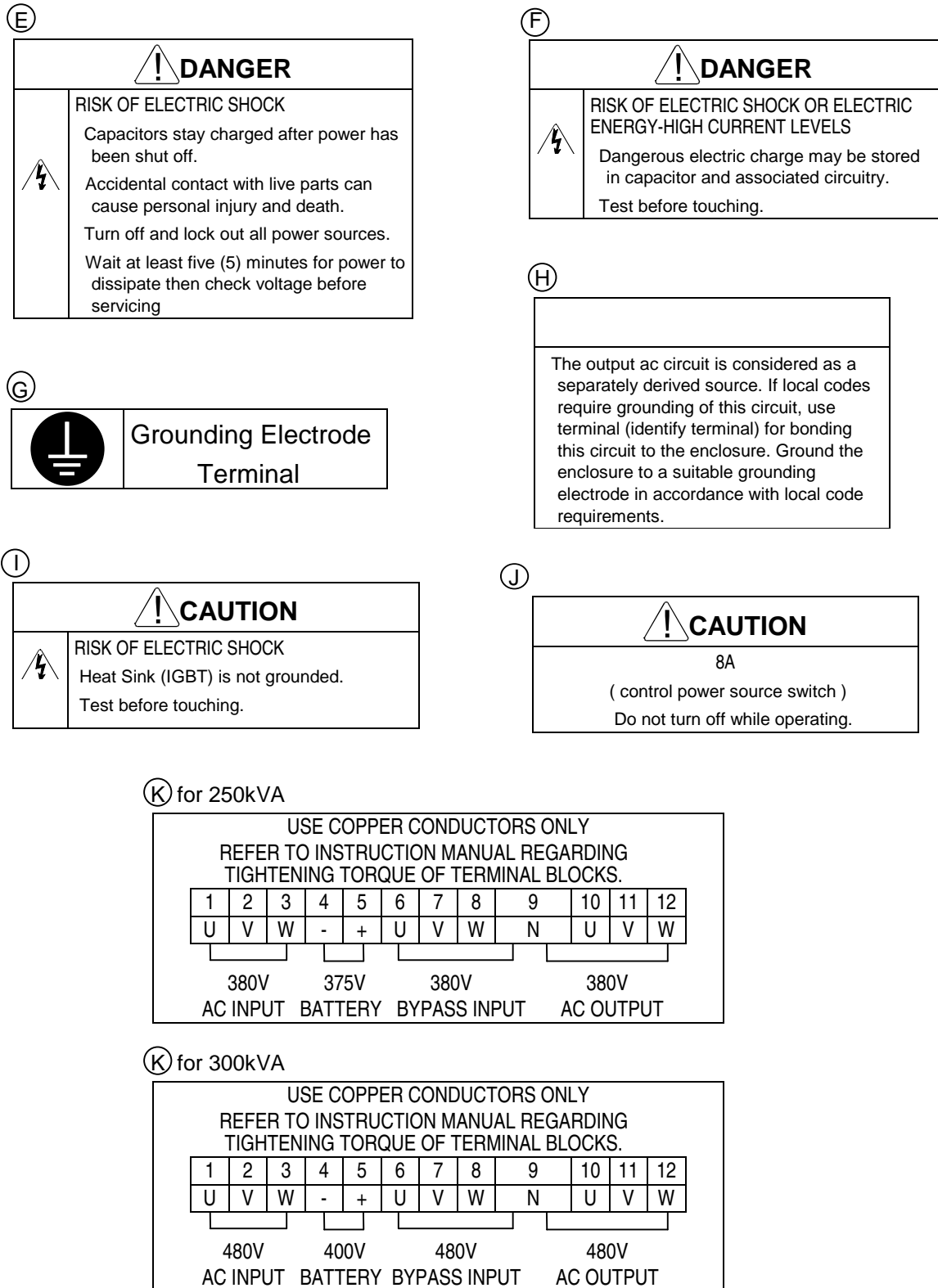
(D)

WARNING

CRITICAL FUSE SIZING

Incorrect fuse replacement size may result in fire or inadequate equipment protection.

Replace only with same type and rating of fuse.



* The label G is attached at the ground wire connection point.

** The label E is mounted in the vicinity of the main circuit transformers and reactors that can be seen from the back of the UPS.

Figure 5.4 - Warning Labels.

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7. Dimensions and Weight

Figure 7.1~7.3 show the outline dimensions and weights of G8000 UPS.

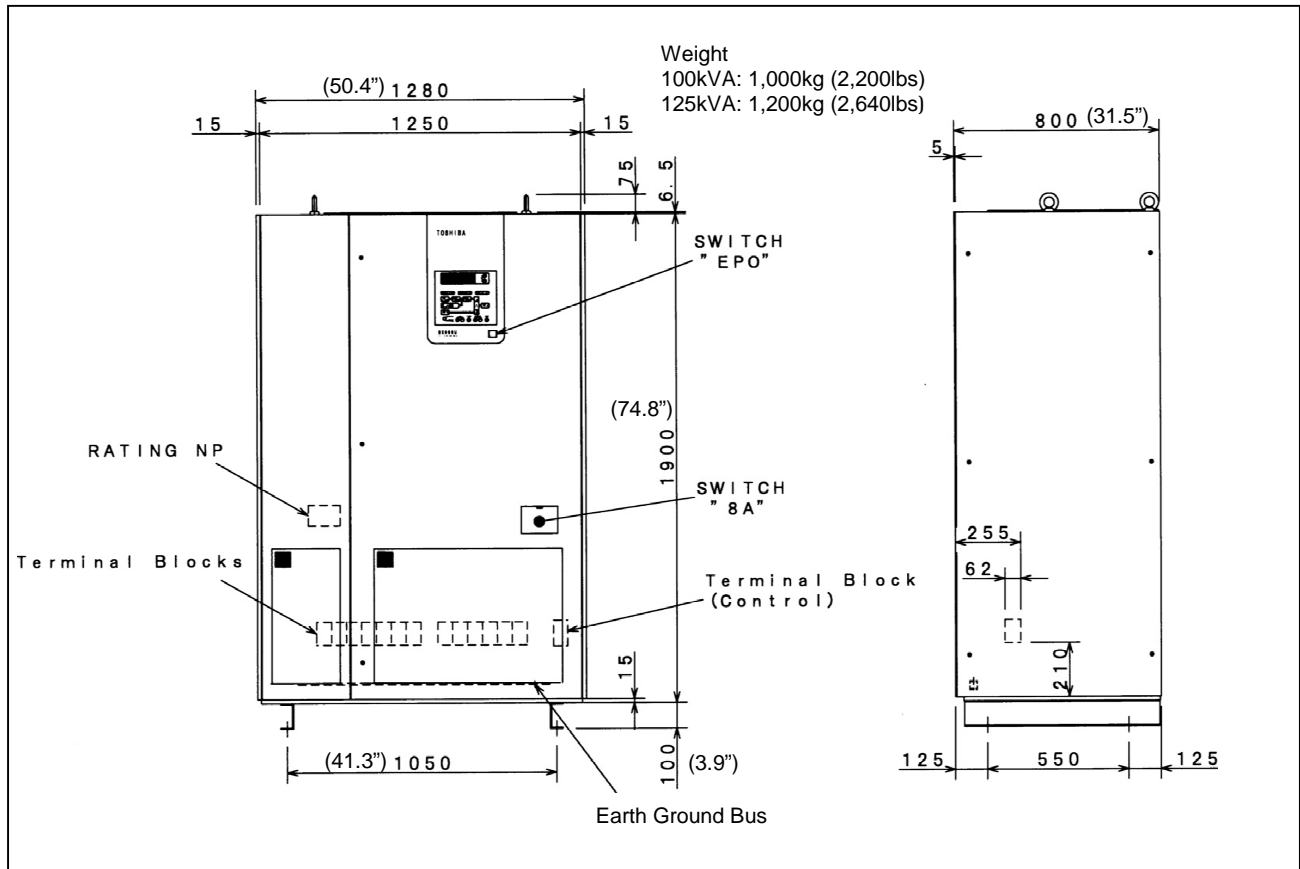


Figure 7.1 - 100/125kVA UPS Exterior dimensions (front & right side).

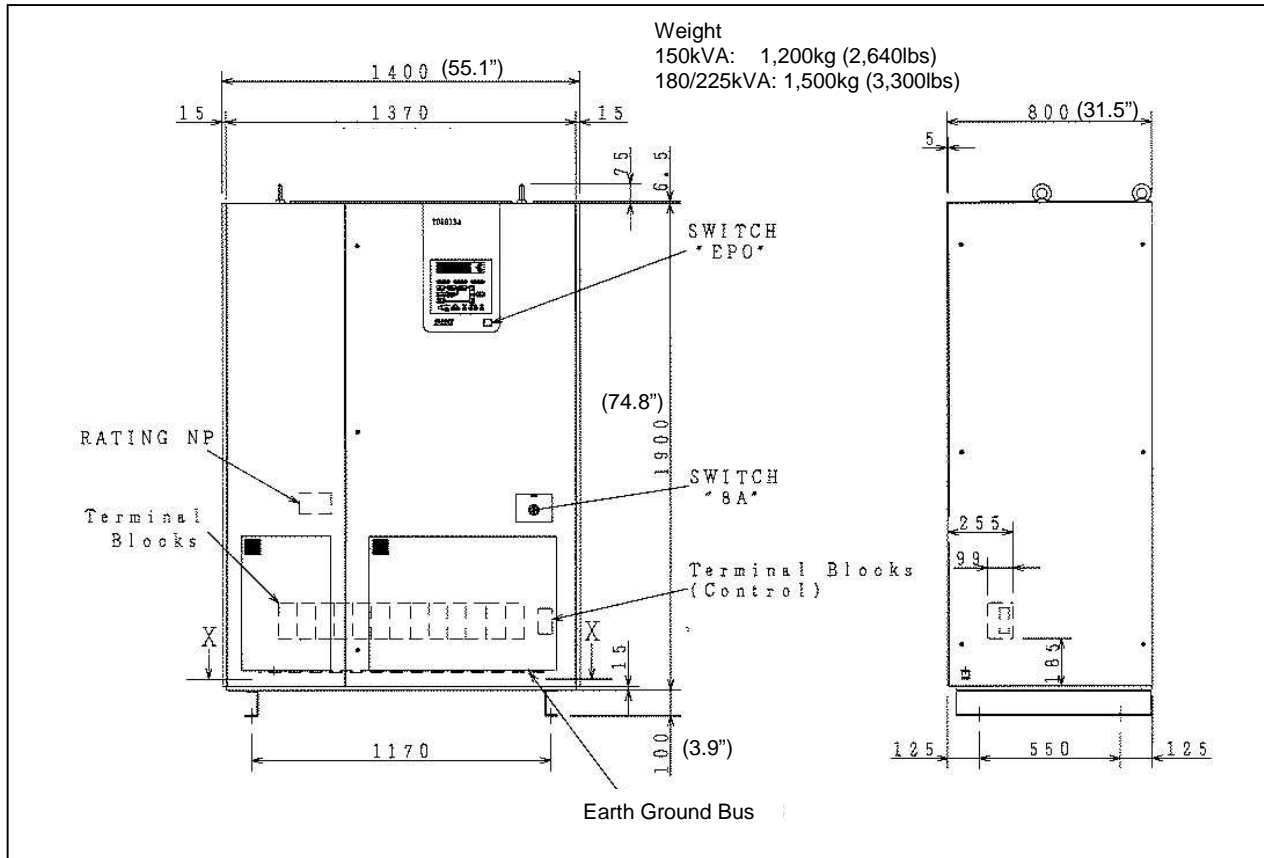


Figure 7.2 - 150/180/225kVA UPS Exterior dimensions (front & right side).

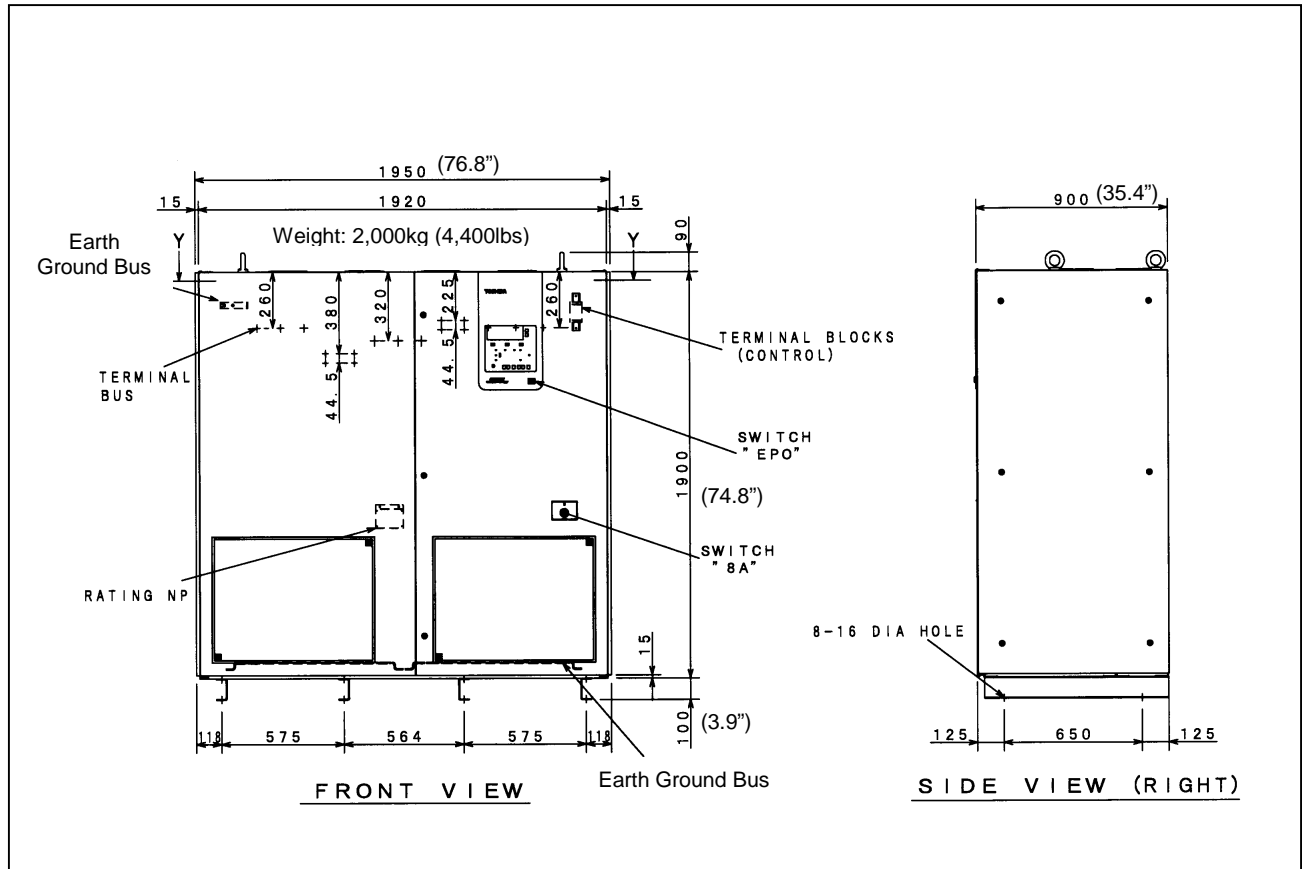




Figure 7.3 - 250/300kVA UPS Exterior dimensions (front & right side).

8. Transportation

 CAUTION	<p>Avoid vibration or shock exceeding 0.5 G to the UPS.</p> <p>Failing to observe this precaution may cause damage to the unit.</p> <p>Do NOT expose the UPS to water.</p> <p>Exposing the UPS to water may damage or deteriorate the UPS.</p>
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The UPS is packed in a crate to bear external force well during transportation. However, the following points should be observed.

- (1) Avoid impact or vibration against the UPS during transportation.
- (2) Be sure that the water does not directly reach the UPS.

 WARNING	<p>When transporting the UPS by using a crane, follow the specified procedure and keep the suspension wire angle within 60°.</p> <p>Moving the UPS by any method other than the specified may cause personal injury by being crushed or trapped by the UPS when it falls or overturns.</p>
---	---

When transporting the UPS by a crane or a forklift truck follow the instructions below.

8.1 Transportation by a crane

Make sure that the suspension wires are hooked at eyebolts on top as shown in Fig 8.1. Keep the angle within 60° between wires. Wires should be weight-rated with the same length. Refer to chapter 7 "Dimension and Weight" for UPS cabinet weight.

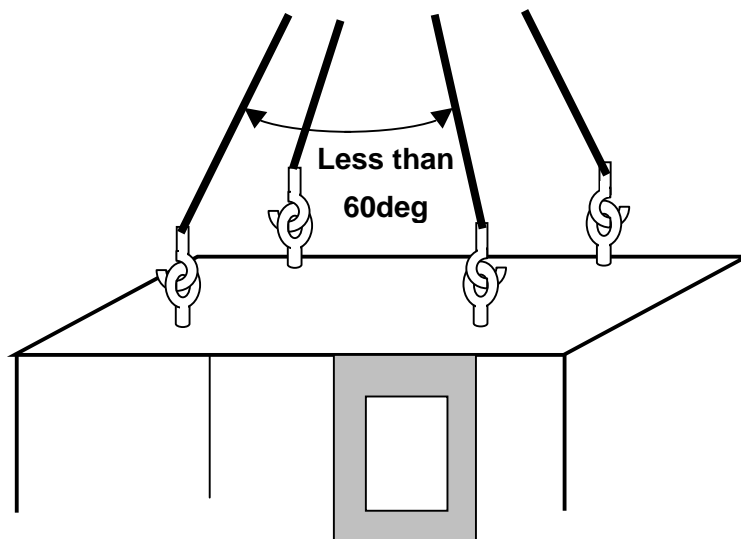


Figure 8.1 - Wires and eyebolts to lift the UPS.

Figure 8.2 and 8.3 show *unacceptable* examples for lifting.

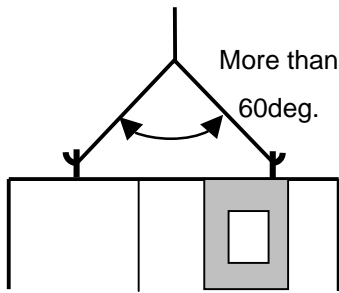


Figure 8.2 - Angle more than 60°

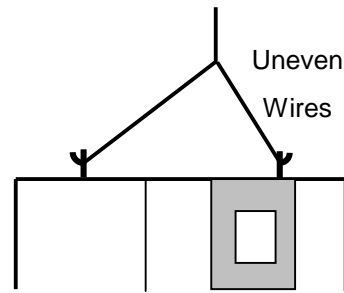


Figure 8.3 - Uneven wires

Make sure that the UPS doesn't swing or tilt. Then lift the UPS. Keep UPS level while lifting.

Minimize the impact of a sudden stop when lowering the UPS to a resting surface. Figure 8.4 and 8.5 show examples of good and unacceptable operations.

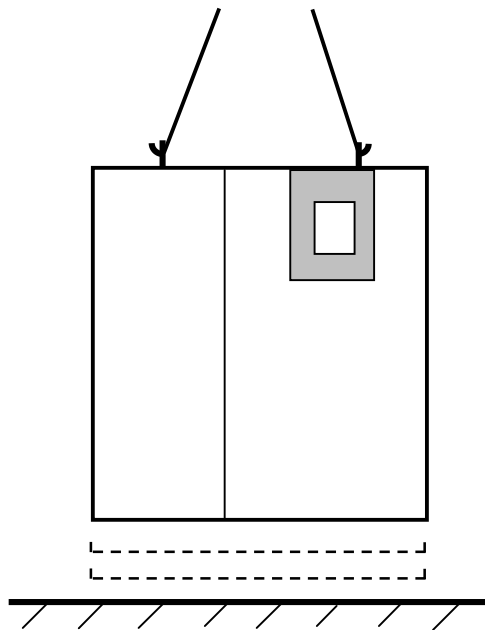


Figure 8.4 - Good operation.

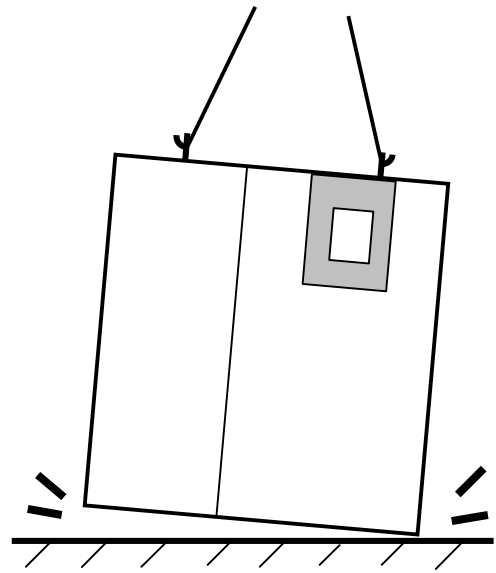
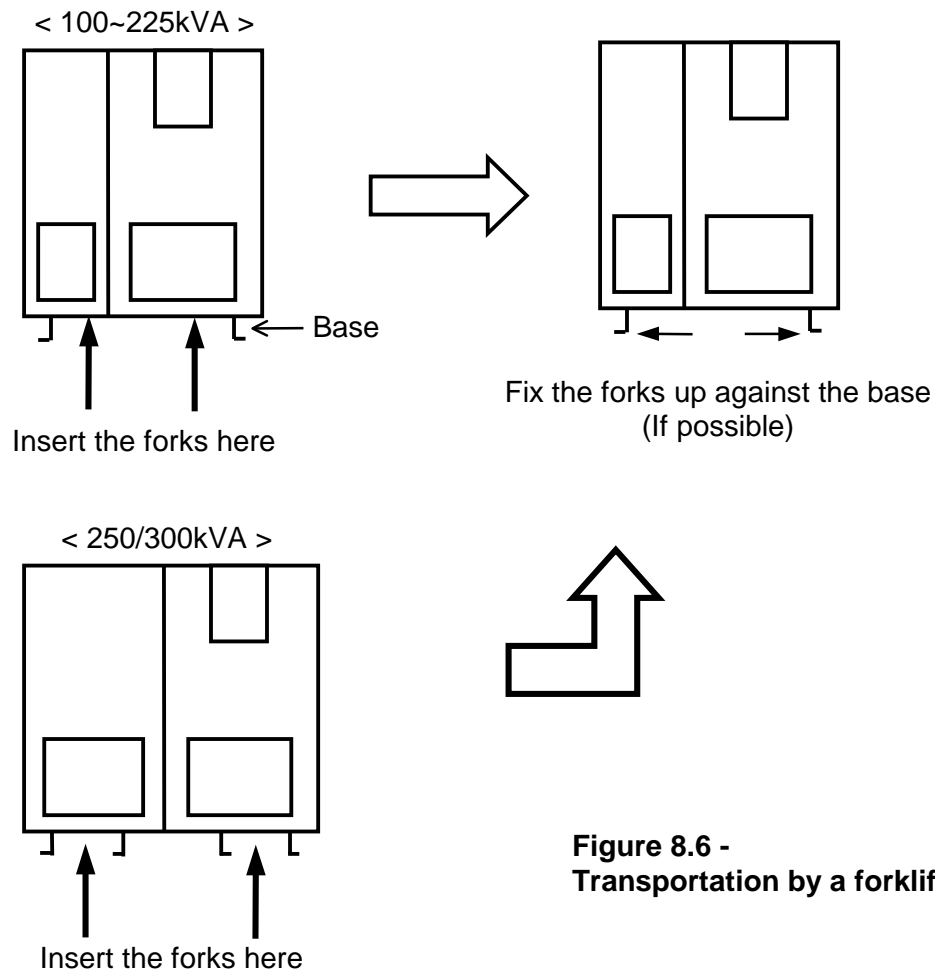


Figure 8.5 - Unacceptable operation.

8.2 Transportation by a forklift

Space for the forks is provided underneath the UPS. Insert the forks into the space shown in Figure 8.6.

Make sure forklift's maximum load is enough to carry UPS. Refer to chapter 7 "Dimension and Weight" for UPS weight.



**Figure 8.6 -
Transportation by a forklift**

Ensure that the UPS does not swing or tilt. Then lift and transport the UPS. Minimize the impact of a sudden stop when lowering the UPS to a resting surface.

9. Storage


Observe following points when storing the UPS.

- (1) Be sure to store UPS indoors.
- (2) The best temperature at storing location is 20~25°C (68~77°F).

In case this temperature is difficult to be maintained, a temperature window of 0~40°C (32~104°F) should be observed. Temperature fluctuations should be minimal.

- (3) Relative humidity at storing location should be 50~60%. Humidity must not exceed 90%.
- (4) Avoid locations where corrosive gas is generated.
- (5) Avoid dirty locations.

10. Installation

 WARNING	<p>When transporting the UPS, do not tilt the UPS more than 10° from upright.</p> <p>Titling the UPS more than 10° may cause personal injury in the event that it falls or is overturned.</p> <p>Do not transport, move, store, or place the UPS on its side.</p> <p>Excessive force applied from heavy objects placed inside of the cabinet may damage the UPS.</p> <p>When unpacking the UPS do not give a direct shock or impact to the UPS using a hammer or disassembling tool.</p> <p>It may damage the UPS.</p> <p>Tighten anchor bolts to secure the UPS to the installation floor.</p> <p>The UPS may fall during an earthquake if the anchor bolts are not installed and secured.</p> <p>Ensure that there is adequate working space around the unpacking/installation area.</p>
---	---

10.1 Unpacking

Make sure that UPS unpacking is conducted on the paved floor indoor, which should be as close as possible to the installing location. A building with overhead traveling cranes is expected to unpack large-sized UPS. If a crane is not available, obtain a wide enough space for forklift operations. Also keep space around the UPS to unpack the crate. Then extract the crate.

Points to be observed

- (1) Retain all small articles during unpacking and installation.
- (2) Make sure that exterior paint is not scratched and that the UPS cabinet is not damaged.
- (3) Do not damage the UPS when using extracting tools.
- (4) Do not remove the polyvinyl chloride cover, if provided, until installation.
- (5) Packing materials should be disposed by the appropriate means after unpacking.
- (6) In case of any abnormalities, immediately report this information to Toshiba or authorized representatives.

10.2 UPS Clearance

When the UPS is installed, maintain the clearance around the UPS as shown in Figure 10.1. Ensure that the front and top air vents are NOT blocked.

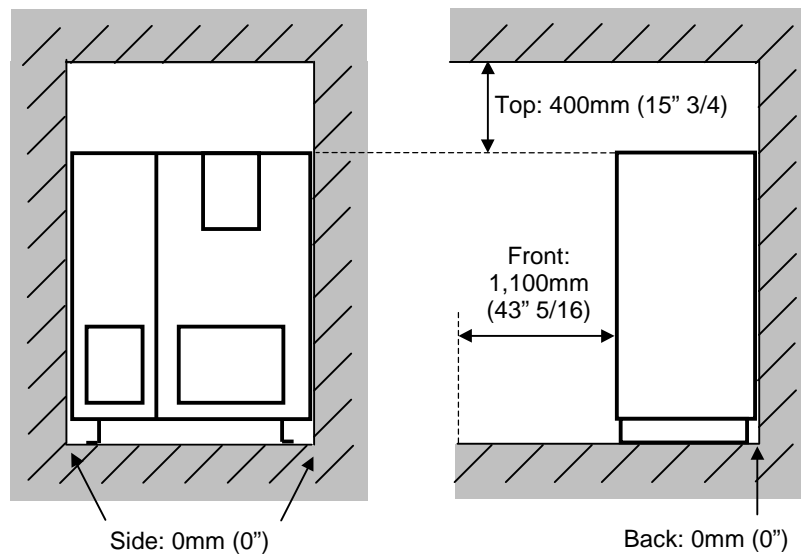
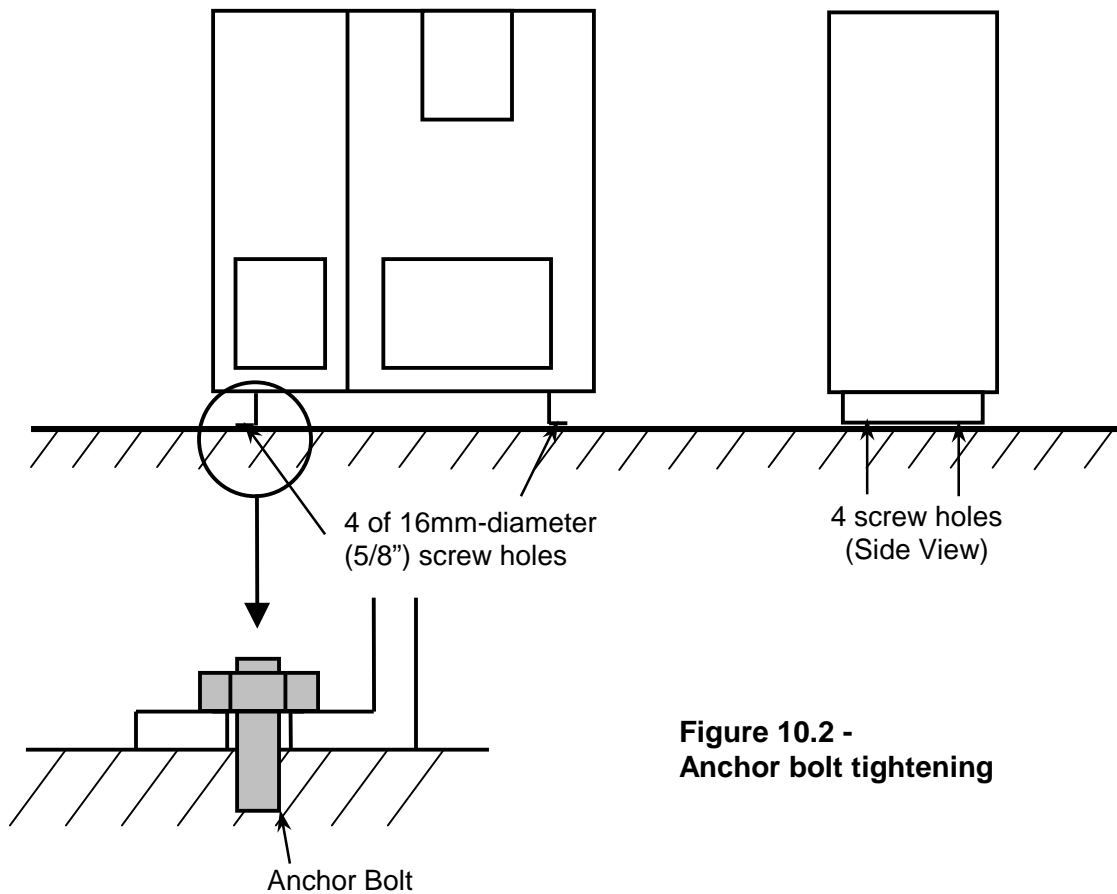


Figure 10.1 - UPS Clearance.

10.3 Anchor bolts

Tighten the anchor bolts to secure the UPS on the floor. Tightening detail is shown in Figure 10.2.

Anchor bolts of 12mm (1/2") diameter are to be used, clearance holes of 16mm (5/8") diameter are provided in the UPS base.



**Figure 10.2 -
Anchor bolt tightening**

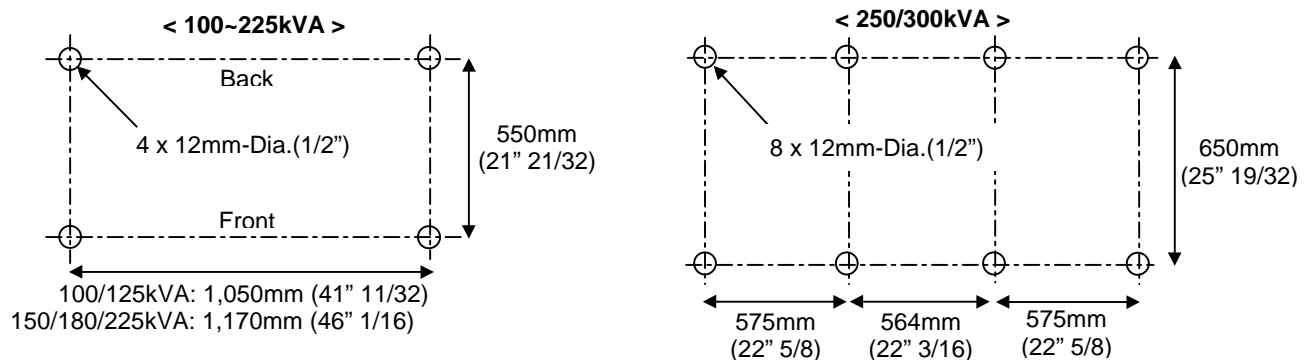


Figure 10.3 - Hole locations and dimensions for anchor bolts.

11. Wiring

11.1 Overview

Figure 11.1 shows the external wiring diagram of G8000 UPS. Wiring work is summarized below.

- 1) Power cable connection for AC input, Bypass Input, AC output, and DC input at terminal blocks or buses.
- 2) External breaker provision at AC input, Bypass Input, AC output, and DC input.
- 3) Earth ground wire at grounding electrode.
- 4) Control wire terminal TB1 (Battery cabinet and Bypass Breaker).

See corresponding section to each wiring term.

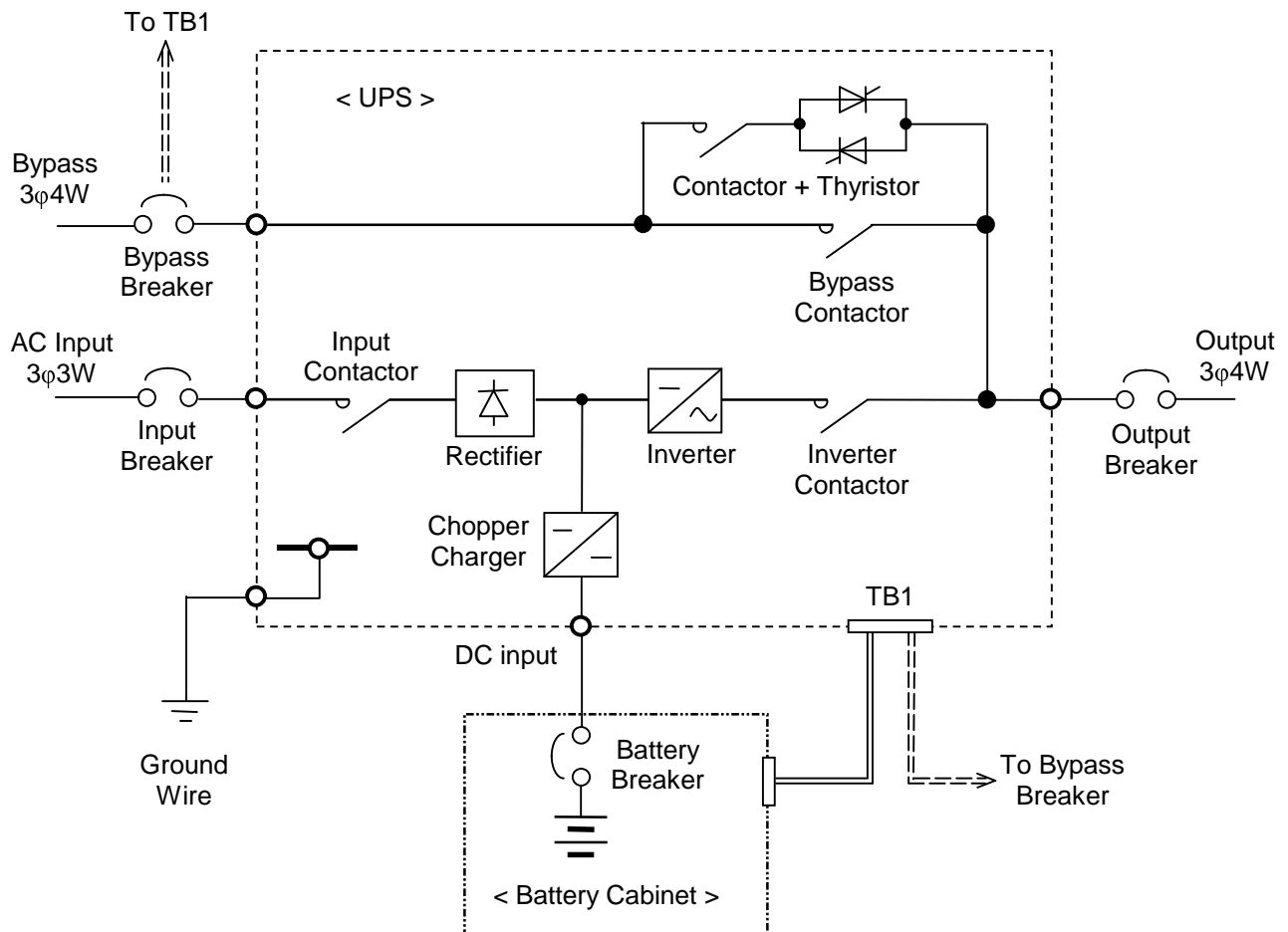


Figure 11.1 - External Wiring Diagram.

11.2 Terminal Blocks and Power Cables

The terminal blocks are shown in Figure 11.2 and are located inside at the bottom of each 100/125/150/180/225kVA UPS.

External cable size and tightening torque are recommended in the Table 11.1~11.5. Only copper wires are allowed for external cables.

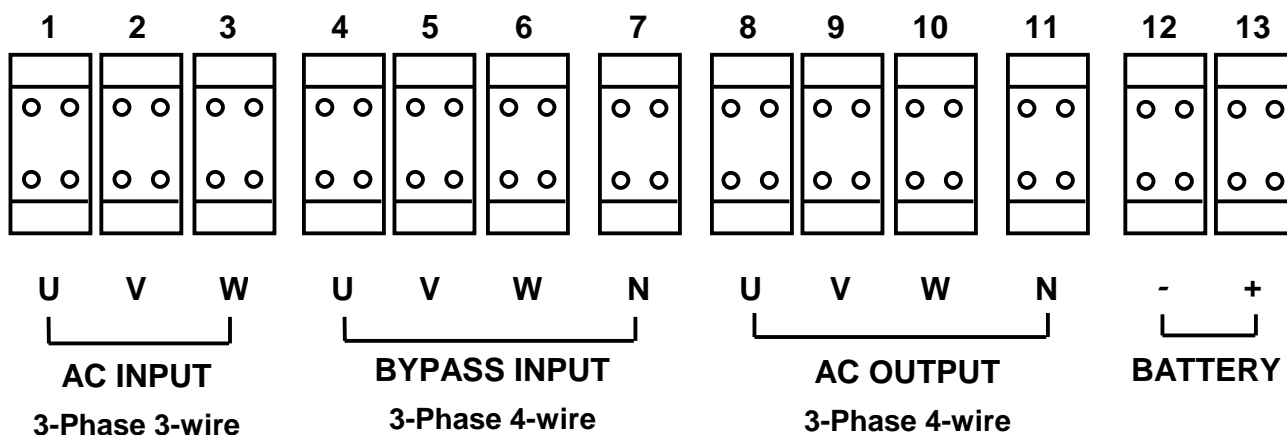


Figure 11.2 - Terminal Blocks of 100/125/150/180/225kVA UPS.

Table 11.1 Recommended Cable Size and Tightening Torque for 100kVA UPS.

Block Number	Cable Size	Tightening Torque
1	AWG 1/0 or larger	3.2 kg-m (275 in-lbs)
2	AWG 1/0 or larger	3.2 kg-m (275 in-lbs)
3	AWG 1/0 or larger	3.2 kg-m (275 in-lbs)
4	AWG 1/0 or larger	3.2 kg-m (275 in-lbs)
5	AWG 1/0 or larger	3.2 kg-m (275 in-lbs)
6	AWG 1/0 or larger	3.2 kg-m (275 in-lbs)
7	AWG 1/0 or larger	3.2 kg-m (275 in-lbs)
8	AWG 1/0 or larger	3.2 kg-m (275 in-lbs)
9	AWG 1/0 or larger	3.2 kg-m (275 in-lbs)
10	AWG 1/0 or larger	3.2 kg-m (275 in-lbs)
11	AWG 1/0 or larger	3.2 kg-m (275 in-lbs)
*12	AWG 3/0 or larger	3.2 kg-m (275 in-lbs)
*13	AWG 3/0 or larger	3.2 kg-m (275 in-lbs)

NOTE: Maximum cable size is 350MCM.

*One battery string (consult factory if using multiple battery strings).

Table 11.2 Recommended Cable Size and Tightening Torque for 125kVA UPS.

Block Number	Cable Size	Tightening Torque
1	AWG 4/0 or larger	3.2 kg-m (275 in-lbs)
2	AWG 4/0 or larger	3.2 kg-m (275 in-lbs)
3	AWG 4/0 or larger	3.2 kg-m (275 in-lbs)
4	AWG 4/0 or larger	3.2 kg-m (275 in-lbs)
5	AWG 4/0 or larger	3.2 kg-m (275 in-lbs)
6	AWG 4/0 or larger	3.2 kg-m (275 in-lbs)
7	AWG 4/0 or larger	3.2 kg-m (275 in-lbs)
8	AWG 4/0 or larger	3.2 kg-m (275 in-lbs)
9	AWG 4/0 or larger	3.2 kg-m (275 in-lbs)
10	AWG 4/0 or larger	3.2 kg-m (275 in-lbs)
11	AWG 4/0 or larger	3.2 kg-m (275 in-lbs)
*12	Two 350MCM	3.2 kg-m (275 in-lbs)
*13	Two 350MCM	3.2 kg-m (275 in-lbs)

NOTE: Maximum cable size is 350MCM.

*One battery string (consult factory if using multiple battery strings).

Table 11.3 Recommended Cable Size and Tightening Torque for 150kVA UPS.

Block Number	Cable Size	Tightening Torque
1	AWG 4/0 or larger	3.2 kg-m (275 in-lbs)
2	AWG 4/0 or larger	3.2 kg-m (275 in-lbs)
3	AWG 4/0 or larger	3.2 kg-m (275 in-lbs)
4	AWG 4/0 or larger	3.2 kg-m (275 in-lbs)
5	AWG 4/0 or larger	3.2 kg-m (275 in-lbs)
6	AWG 4/0 or larger	3.2 kg-m (275 in-lbs)
7	AWG 4/0 or larger	3.2 kg-m (275 in-lbs)
8	AWG 4/0 or larger	3.2 kg-m (275 in-lbs)
9	AWG 4/0 or larger	3.2 kg-m (275 in-lbs)
10	AWG 4/0 or larger	3.2 kg-m (275 in-lbs)
11	AWG 4/0 or larger	3.2 kg-m (275 in-lbs)
*12	Two 350MCM or larger	3.2 kg-m (275 in-lbs)
*13	Two 350MCM or larger	3.2 kg-m (275 in-lbs)

NOTE: Maximum cable size is 350MCM.

*One battery string (consult factory if using multiple battery strings).

Table 11.4 Recommended Cable Size and Tightening Torque for 180kVA UPS.

Block Number	Cable Size	Tightening Torque
1	Two 2/0 or larger	5.8 kg-m (500 in-lbs)
2	Two 2/0 or larger	5.8 kg-m (500 in-lbs)
3	Two 2/0 or larger	5.8 kg-m (500 in-lbs)
4	Two 2/0 or larger	5.8 kg-m (500 in-lbs)
5	Two 2/0 or larger	5.8 kg-m (500 in-lbs)
6	Two 2/0 or larger	5.8 kg-m (500 in-lbs)
7	Two 2/0 or larger	5.8 kg-m (500 in-lbs)
8	Two 2/0 or larger	5.8 kg-m (500 in-lbs)
9	Two 2/0 or larger	5.8 kg-m (500 in-lbs)
10	Two 2/0 or larger	5.8 kg-m (500 in-lbs)
11	Two 2/0 or larger	5.8 kg-m (500 in-lbs)
*12	Two 4/0 or larger	5.8 kg-m (500 in-lbs)
*13	Two 4/0 or larger	5.8 kg-m (500 in-lbs)

NOTE: Maximum cable size is 350MCM.

*Two battery strings or more (consult factory if using one battery string).

Table 11.5 Recommended Cable Size and Tightening Torque for 225kVA UPS.

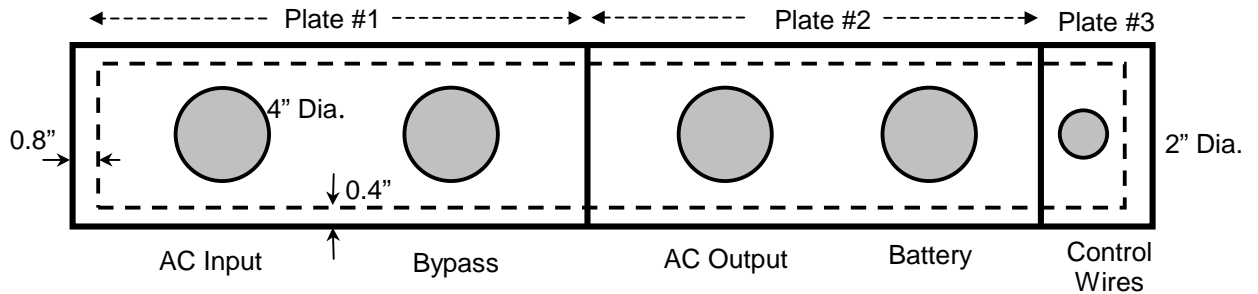
Block Number	Cable Size	Tightening Torque
1	Two 2/0 or larger	5.8 kg-m (500 in-lbs)
2	Two 2/0 or larger	5.8 kg-m (500 in-lbs)
3	Two 2/0 or larger	5.8 kg-m (500 in-lbs)
4	Two 2/0 or larger	5.8 kg-m (500 in-lbs)
5	Two 2/0 or larger	5.8 kg-m (500 in-lbs)
6	Two 2/0 or larger	5.8 kg-m (500 in-lbs)
7	Two 2/0 or larger	5.8 kg-m (500 in-lbs)
8	Two 2/0 or larger	5.8 kg-m (500 in-lbs)
9	Two 2/0 or larger	5.8 kg-m (500 in-lbs)
10	Two 2/0 or larger	5.8 kg-m (500 in-lbs)
11	Two 2/0 or larger	5.8 kg-m (500 in-lbs)
*12	Two 4/0 or larger	5.8 kg-m (500 in-lbs)
*13	Two 4/0 or larger	5.8 kg-m (500 in-lbs)

NOTE: Maximum cable size is 350MCM.

*Two battery strings or more (consult factory if using one battery string).

Three cable knockout plates are provided at bottom of each 100/125/150/180/225kVA UPS. Holes are recommended in Figure 11.3.

The installing electrical contractor must punch the 5 holes.



Three solid rectangles show the cable knockout plates' outline. The dashed rectangle shows the UPS opening under the plates.

Figure 11.3 - Cable knockout plates at the bottom (100~225kVA).

The terminal busses are shown in Figure 11.4. The busses are located inside of the 250/300kVA UPS at the top. The dashed line shows the side view of the screw holes. The screws are used to tighten the lugs.

External cable size recommendations are located in Table 11.6 and 11.7. These tables show only the torque to tighten a terminal bus & a corresponding lug. Torque to tighten the cable end in a compression lug shall be specified by the lug vendor recommended in Table 11.8.

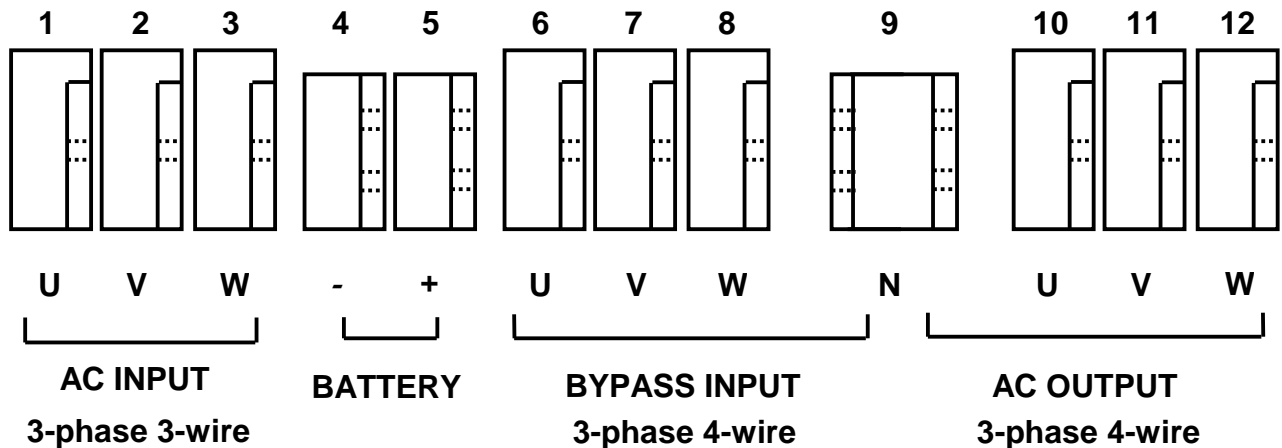


Figure 11.4 - Terminal Busses of the 250/300kVA UPS.

Table 11.6 Recommended Cable Size and Tightening Torque for 250kVA UPS.

Bus Number	Cable Size	Torque to tighten the terminal bus
1	Two 250MCM or larger	2.5~4.5 kg-m (215~386 in-lbs)
2	Two 250MCM or larger	2.5~4.5 kg-m (215~386 in-lbs)
3	Two 250MCM or larger	2.5~4.5 kg-m (215~386 in-lbs)
*4	Two 350MCM or larger	2.5~4.5 kg-m (215~386 in-lbs)
*5	Two 350MCM or larger	2.5~4.5 kg-m (215~386 in-lbs)
6	Two 250MCM or larger	2.5~4.5 kg-m (215~386 in-lbs)
7	Two 250MCM or larger	2.5~4.5 kg-m (215~386 in-lbs)
8	Two 250MCM or larger	2.5~4.5 kg-m (215~386 in-lbs)
9	Two 250MCM or larger	2.5~4.5 kg-m (215~386 in-lbs)
10	Two 250MCM or larger	2.5~4.5 kg-m (215~386 in-lbs)
11	Two 250MCM or larger	2.5~4.5 kg-m (215~386 in-lbs)
12	Two 250MCM or larger	2.5~4.5 kg-m (215~386 in-lbs)

NOTE: Maximum cable size is 600MCM.

*Two battery strings or more (consult factory if using one battery string).

Table 11.7 Recommended Cable Size and Tightening Torque for 300kVA UPS.

Bus Number	Cable Size	Torque to tighten the terminal bus
1	Two 4/0 AWG or larger	2.5~4.5 kg-m (215~386 in-lbs)
2	Two 4/0 AWG or larger	2.5~4.5 kg-m (215~386 in-lbs)
3	Two 4/0 AWG or larger	2.5~4.5 kg-m (215~386 in-lbs)
4	Three 350 MCM or larger	2.5~4.5 kg-m (215~386 in-lbs)
*5	Three 350 MCM or larger	2.5~4.5 kg-m (215~386 in-lbs)
*6	Two 4/0 AWG or larger	2.5~4.5 kg-m (215~386 in-lbs)
7	Two 4/0 AWG or larger	2.5~4.5 kg-m (215~386 in-lbs)
8	Two 4/0 AWG or larger	2.5~4.5 kg-m (215~386 in-lbs)
9	Two 4/0 AWG or larger	2.5~4.5 kg-m (215~386 in-lbs)
10	Two 4/0 AWG or larger	2.5~4.5 kg-m (215~386 in-lbs)
11	Two 4/0 AWG or larger	2.5~4.5 kg-m (215~386 in-lbs)
12	Two 4/0 AWG or larger	2.5~4.5 kg-m (215~386 in-lbs)

NOTE: Maximum cable size is 600MCM.

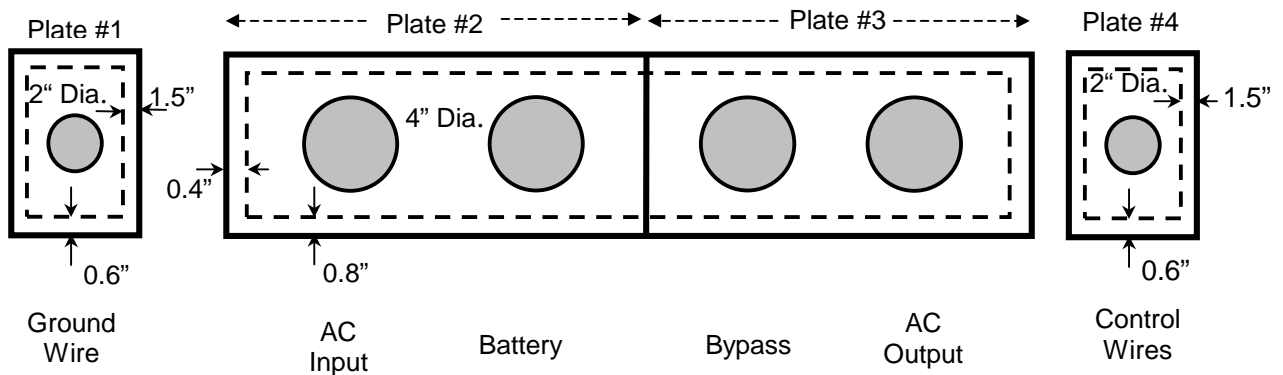
*Two battery strings or more (consult factory if using one battery string).

Table 11.8 Recommended Lugs.

At Terminal Bus #	Recommendation	
	Vendor	Catalog #
1	ILSCO	TA-600
2		AU-600
3		
4	ILSCO	TA-600
5		T3A2-600N
6	ILSCO	TA-600
7		AU-600
8		
9		TA-600, T3A2-600N
10		TA-600
11		AU-600
12		

Four cable knockout plates are provided at the top of the 250/300kVA UPS. See Figure 11.5 for hole information.

The six holes must be punched during installation.



Four solid rectangles show the outline of the cable knockout plates. The three dashed rectangles show the UPS opening under the plates.

Figure 11.5 - Cable knockout plates at the top (250/300kVA).

11.3 External Breakers


The G8000 UPS units are not equipped with circuit breakers. The electrical contractor should provide the external breakers for AC input, Bypass input, DC input, and AC output. See Figure 11.1 for the position of the breakers.

Table 11.9 shows the minimum rating for each capacity of G8000 UPS breakers. The Bypass input and the AC output require 4-pole breakers.

Table 11.9 External Breaker Rating.

Capacity	AC input / Bypass input / AC output Minimum Breaker Rating	DC input Minimum Breaker Rating
100kVA	480V - 150A	500VDC – 400A
125kVA	380V - 250A	500VDC – 600A
150kVA	480V - 225A	500VDC – 600A
180kVA	380V - 350A	500VDC – 750A
225kVA	480V - 350A	500VDC – 900A
250kVA	380V - 500A	500VDC – 1100A
300kVA	480V - 450A	500VDC – 1,200A

11.4 Grounding Wire

 WARNING	<p>Be sure to ground the UPS as specified.</p> <p>Using the UPS without a proper ground will deteriorate the insulation and may cause electric shock due to leakage currents.</p> <p>The resistance to ground should be 10Ω or less.</p>
--	---

A grounding bus is provided on the inside of the each unit. The bus is located on the front at the bottom of the UPS units. For the 250/300kVA unit, it is located on the top left. See chapter 7 “Dimensions and Weight” for bus location detailed.

It is recommended that 2 AWG (or 38mm²) or larger cable be used for the grounding wire. The wire shall be fed through an opening at the bottom, or through a hole on a knockout plate (250/300kVA only). See Figure 11.5 for knockout plate detail. Only one of 2 ground buses on top and at bottom shall be connected to the ground for 250/300kVA.

The cable end must have Amp terminal of 1/2” (12mm) diameter hole to tighten with ground bus inside the UPS, as the ground bus has 3/8” (13mm) screw hole.

The Amp terminal and ground bus shall be tightened with a 7/16” (10mm) diameter screw.

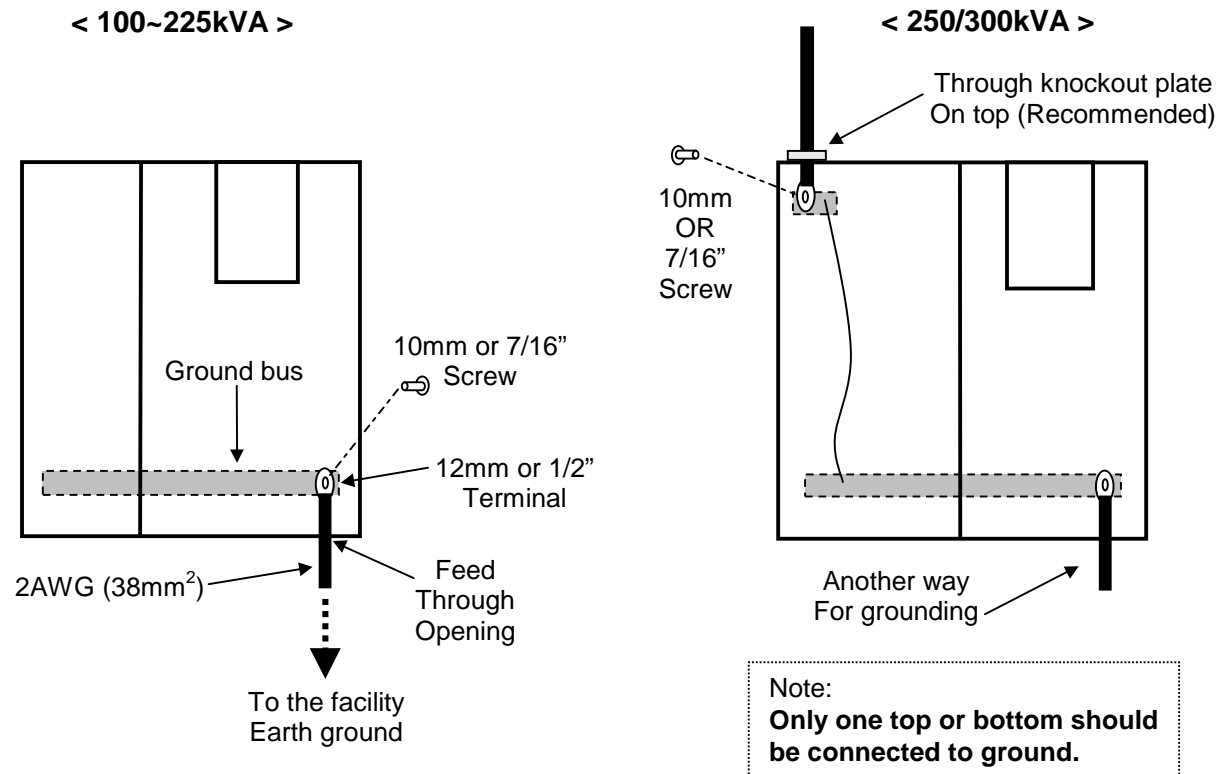


Figure 11.6 - Earth Ground Wiring.

11.5 Control Wires

The terminal layout of control wires at TB1 is shown in Table 11.10.

Table 11.10 External Connections

No.	I/O	Signal Name	Operation
1	Output	Low Battery	Close at Low Battery
2	Output	Backup Operation	Close while Backup Operation
3	Output	Fault	Close by Faults
4	Output	Inverter Supply	Close during Normal Operation
5	Output	Warning	Close by Warnings
6	Input	P24 Remote Run	Close to run UPS
7	Input		
8	Input	P24 Remote Stop	Close to stop UPS
9	Input		
10	Output	Bypass Supply	Close during Bypass Operation
11	Output	Output Signal Ground	(Ground for pin #1~5 & #10)
12	Input	P24 Battery Overheat	Battery's Overheat B-contact
13	Input		
14	Output	52C Trip Signal	Bypass Breaker Shunt Trip Signal by EPO
15	Output		
16	Output	72B Trip Signal	Battery Breaker shunt trip by EPO or Battery shutdown
17	Output		
18	Output	72B Aux. Contact	Battery breaker's Auxiliary A-contact
19	Output		

The UPS, the battery cabinet, and the bypass breaker should be wired as shown in Figure 11.7.

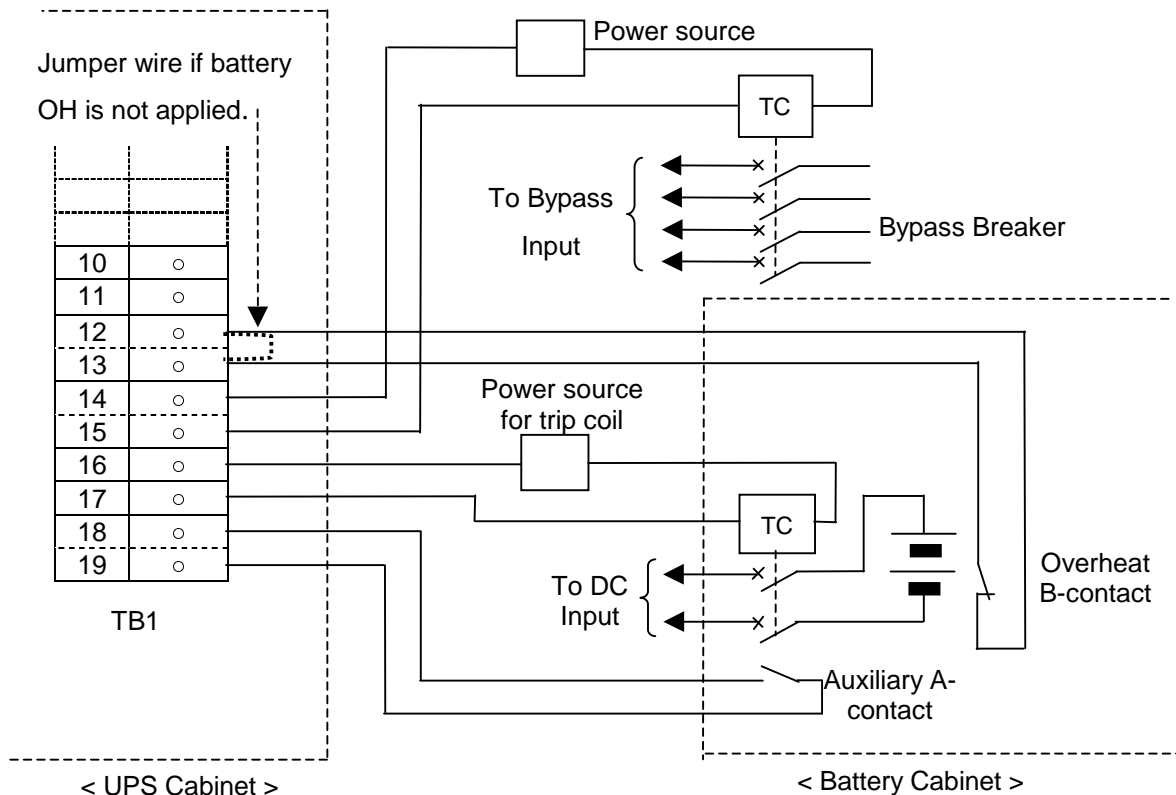


Figure 11.7 - Connection among UPS, battery cabinet & bypass breaker

11.6 Grounding configuration

This section describes the grounding configuration with AC input service entrance.

As inadequate grounding configuration causes problems on start-up, connections for the ground line and the neutral line must be done properly according to the system configuration.

11.6.1 Recommended configuration with input neutral grounded

Figure 11.8 shows recommended grounding configuration with input neutral grounded.

The neutral line at the input source is usually grounded. The neutral terminal in the UPS cabinet should be open, as the neutral line must be grounded only at one point in a system. And the neutral line must be properly fed to the bypass input.

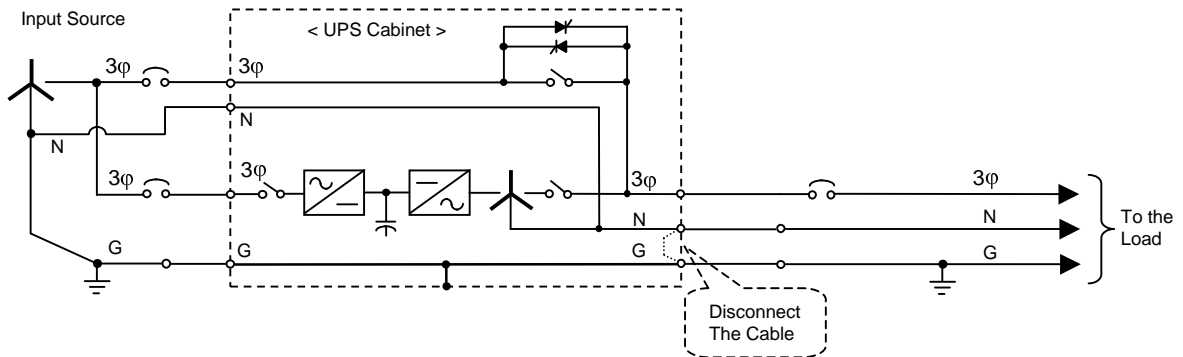


Figure 11.8 - Grounding configuration with input neutral grounded.

A jumper cable of 2AWG (or 38mm²) is provided between the neutral terminal and ground bus in the UPS cabinet. Notice that the electrical contractor should unscrew and disconnect the jumper cable in this configuration. The cable location is illustrated below.

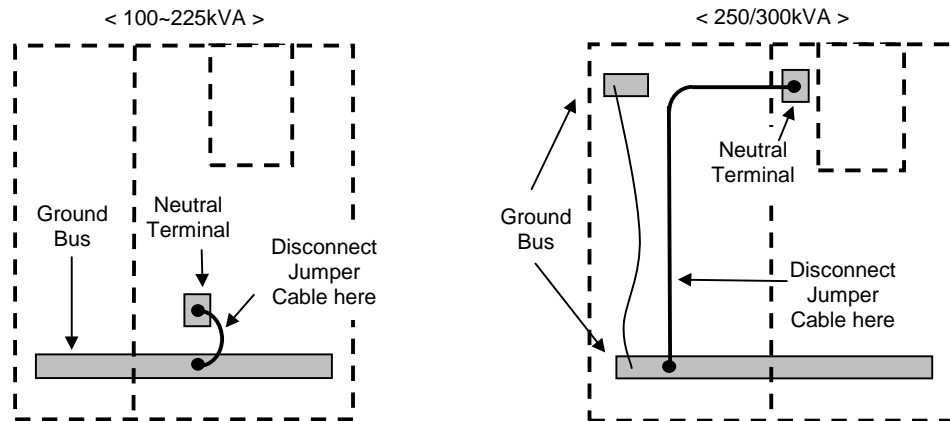


Figure 11.9 - Jumper cable between the neutral terminal & ground bus.

11.6.2 Grounding configuration without input neutral

When the neutral line cannot be fed to the bypass input from the input source which is wye-connected, the neutral terminal in the UPS cabinet must be connected to the ground bus in order to stabilize the UPS potential as shown in Figure 11.10. Thus, the jumper cable should stay on. See Figure 11.9 for the jumper cable location.

However, there will be circulating current between the UPS and the bypass, whenever the UPS transfers to/from the bypass. And the current will flow through the ground path instead of neutral line like that in Figure 11.8.

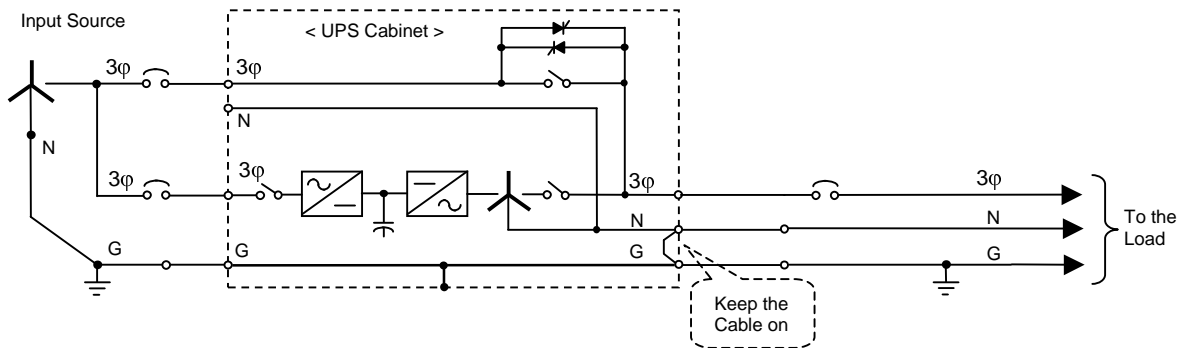


Figure 11.10 - Grounding configuration without input neutral.

If a ground fault interrupter is installed, the system is likely to trip the interrupter during transferring to/from the bypass circuit. It is recommended to put 0.5 sec or longer delay on the ground fault interrupter.

11.6.3 Recommended configuration with delta-input

If the input source has a delta-connection (3-phase 3-wire) without ground, the neutral terminal in the UPS cabinet must be connected to the ground bus as shown in Figure 11.11.

So, the jumper cable should stay on. See Figure 11.9 for the jumper cable location.

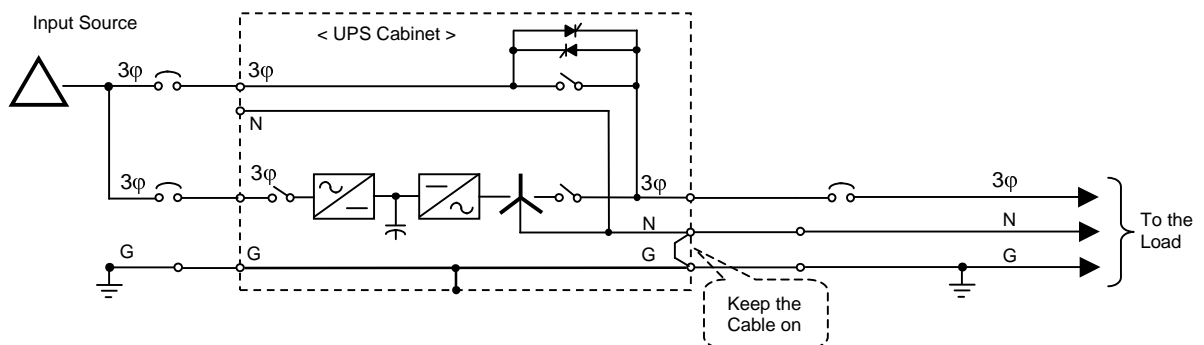


Figure 11.11 - Grounding configuration with non-grounded delta-input.

11.6.4 Grounding configuration with corner-grounded delta-input

If a phase of delta-input source is grounded (B-phase for example), the ground bus in the UPS cabinet should NOT be connected to the neutral terminal of UPS output. So, the jumper cable should be disconnected. See Figure 11.9 for the jumper cable location.

The UPS output is floating against ground during normal operation. An isolation transformer is recommended at output distribution as shown in Figure 11.12.

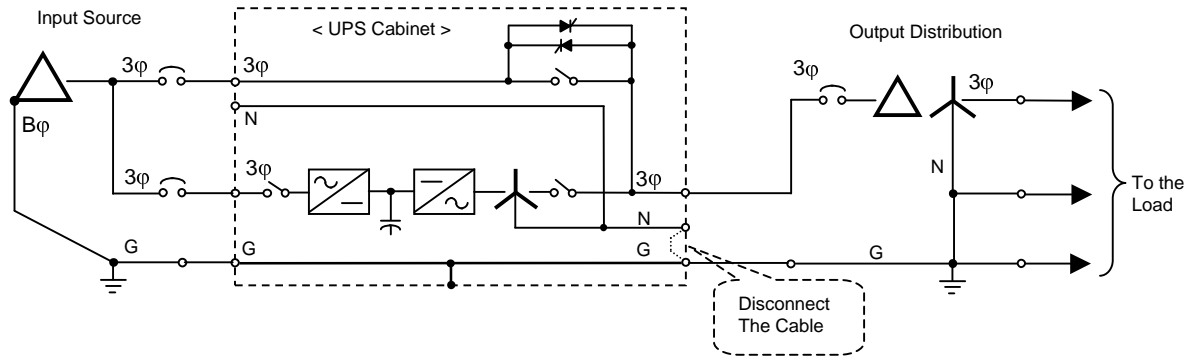


Figure 11.12 - Grounding configuration with corner-grounded delta-input.

Filename: 57490-000 Install
Directory: J:\inverter\users\jlwilliams\Technical Publications\UPS\G-8000\Deliverables
Template: C:\Program Files\Microsoft Office\Templates\Normal.dot
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Subject:
Author: K.Okizaki
Keywords:
Comments:
Creation Date: 01/19/05 1:00 PM
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Last Saved On: 02/07/05 7:12 AM
Last Saved By: Toshiba
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As of Last Complete Printing
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Number of Words: 5,307 (approx.)
Number of Characters: 30,252 (approx.)